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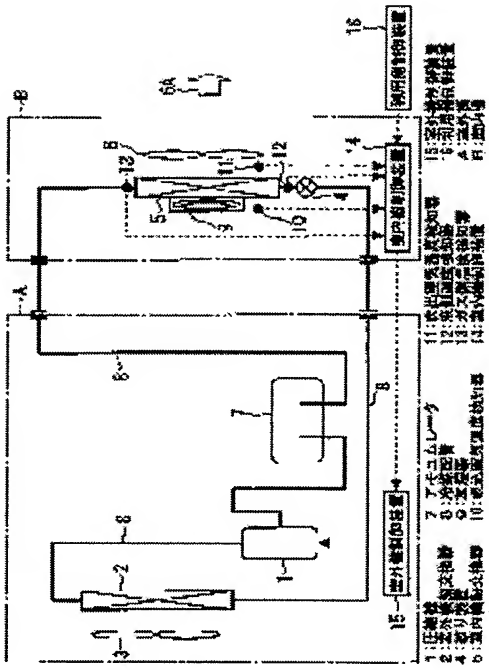
(54) AIR CONDITIONER

(57)Abstract:

PROBLEM TO BE SOLVED: To solve problems in a vapor pan type humidifier usually used in performing cooling and air conditioning throughout the year where humidifying capacity decreases when a maintenance is not performed periodically, the inside of the humidifier gets soiled, and electric power is always required.

SOLUTION: This air conditioner comprises an outdoor machine A and an indoor machine B. The outdoor machine A comprises a compressor 1, an outdoor machine heat exchanger 2 for condensing and liquefying gas refrigerant delivered from the compressor, and an accumulator 7 connected to the suction side of the compressor. The indoor machine B comprises a throttle device 4 for decompressing liquefied refrigerant from the outdoor machine heat exchanger 2, an indoor machine heat exchanger 5 disposed in a predetermined air duct on the use side for evaporating and gasifying the refrigerant decompressed by the throttle device 4, and making the refrigerant flow into the accumulator, and a natural evaporation type humidifier 9 disposed on the primary side of the air duct 6A of the indoor machine heat exchanger.



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A conditioner provided with an interior unit characterized by comprising the following.
A compressor.
An exterior unit heat exchanger which condensate-izes a gas refrigerant breathed out from this compressor.
An exterior unit which has the accumulator connected to an inlet side of the above-mentioned compressor, and an collimator which decompresses a liquefied refrigerant from the above-mentioned exterior unit heat exchanger.
An interior unit heat exchanger which is a use side, is allocated all over a predetermined air course, evaporates a refrigerant decompressed by the above-mentioned collimator, gasifies, and is made to flow into the above-mentioned accumulator, and a natural vaporization type humidifier formed in a primary side of an air course of the above-mentioned interior unit heat exchanger.

[Claim 2]The conditioner according to claim 1, wherein the above-mentioned interior unit heat exchanger is allocated so that a refrigerant inlet may be located in the downstream of an air course and a refrigerant exit may be located in a primary side of an air course.
[Claim 3]The conditioner according to claim 1 or 2 making a pipe supplementary biography hot surface product of the above-mentioned interior unit heat exchanger large to such an extent that sufficient refrigeration capacity is securable, even if evaporating temperature is high.
[Claim 4]A conditioner of claim 1 using the above-mentioned compressor as a capacity variable type compressor - claim 3 given in any 1 paragraph.
[Claim 5]The conditioner according to claim 4 provided with a control device which carries out capacity control of the compressor so that the liquid side temperature of the above-mentioned interior unit heat exchanger may turn into more than prescribed temperature.
[Claim 6]The conditioner according to claim 5, wherein the above-mentioned prescribed temperature is the dew-point temperature.
[Claim 7]The conditioner according to claim 6 characterized by making it the above-mentioned dew-point temperature make a solution temperature degree lower limit computed by deducting constant temperature from suction air temperature of an interior unit heat exchanger correspond.
[Claim 8]The conditioner according to claim 6 computing the above-mentioned dew-point temperature based on suction air temperature and humidity of an interior unit heat exchanger.
[Claim 9]A conditioner provided with one set of an interior unit characterized by comprising the following, and a natural vaporization type humidifier formed in a primary side of an air course of each above-mentioned interior unit heat exchanger.
A compressor.
An exterior unit heat exchanger which condensate-izes a gas refrigerant breathed out from this compressor.
The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to an inlet side of the above-mentioned compressor, respectively, and decompress liquid cooling intermediation.

A blowing means which forms an air course for heat exchange to the 1st and 2nd interior unit heat exchangers that evaporate a refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into an accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, and each above-mentioned interior unit heat exchanger.

[Claim 10]A conditioner provided with a control device which controls more highly than evaporating temperature of the 2nd interior unit heat exchanger evaporating temperature of one set of an interior unit characterized by comprising the following, a natural vaporization type humidifier formed in a primary side of an air course of an interior unit heat exchanger of the above 1st, and an interior unit heat exchanger of the above 1st.
A compressor.
An exterior unit heat exchanger which condensate-izes a gas refrigerant breathed out from this compressor.
The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to an inlet side of the above-mentioned compressor, respectively, and decompress liquid cooling intermediation.
A blowing means which forms an air course for heat exchange to the 1st and 2nd interior unit heat exchangers that evaporate a refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into an accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, and each above-mentioned interior unit heat exchanger.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the conditioner which performs air conditioning air conditioning through every year like a conditioner, especially a computer room.
[0002]
[Description of the Prior Art]Since the compressor of the annual air conditioning conditioner in the conventional computer room was fixed capacity, it performed reheating at the time of low loading, and was performing capability adjustment. In order to be accompanied by excessive dehumidification in that case, the humidifier of the vapor bread method of the common knowledge which humidifies compulsorily because of humidity control was used.
[0003]
[Problem(s) to be Solved by the Invention]Since electric power was always needed in the conventional conditioner which humidifies compulsorily with a vapor bread method, there was a problem that power consumption increased. By a vapor bread method, when not maintained periodically, there was a problem that the fall of humidifying capacity and the inside of a conditioner became dirty. Power consumption was unnecessary as a humidifier, though the natural vaporization type humidifier with easy cleaning was used, since the temperature of the air which passes a natural vaporization type humidifier was low, sufficient humidifying capacity could not be demonstrated but utilization was difficult.
[0004]An object of this invention is to obtain the conditioner which can use a natural vaporization type humidifier efficiently by the capacity control of a compressor, when it was made in order to solve the above problems, and performing air conditioning air conditioning through every year.
[0005]
[Means for Solving the Problem]An exterior unit heat exchanger which condensate-izes a gas refrigerant in which a conditioner concerning this invention was breathed out from a compressor and this compressor, An exterior unit which has the accumulator connected to an inlet side of a compressor, and an collimator which decompresses a liquefied refrigerant from an exterior unit heat exchanger, It is a use side and is allocated all over a predetermined air course, and a refrigerant decompressed by an collimator is evaporated, and it gasifies, and has an interior unit which has an interior unit heat exchanger made to flow into an accumulator, and the natural vaporization type humidifier formed in a primary side of an air course of this interior unit heat exchanger.
[0006]A conditioner concerning this invention is allocated so that a refrigerant inlet of an interior unit heat exchanger may be located in the downstream of an air course and a refrigerant exit may be located in a primary side of an air course again.
[0007]Even if evaporating temperature is high, the conditioner concerning this invention enlarges a pipe supplementary biography hot surface product of an interior unit heat exchanger again to such an extent that it can secure sufficient refrigeration capacity.
[0008]A conditioner concerning this invention uses a compressor as a capacity variable type compressor again.

[0009]A conditioner concerning this invention is provided with a control device which carries out capacity control of the compressor again so that the liquid side temperature of an interior unit heat exchanger may turn into more than prescribed temperature.
[0010]A conditioner concerning this invention makes prescribed temperature the dew-point temperature again.
[0011]It is made for a conditioner concerning this invention to make a solution temperature degree lower limit computed again by deducting constant temperature from suction air temperature of an interior unit heat exchanger as the dew-point temperature correspond.
[0012]A conditioner concerning this invention computes the dew-point temperature based on suction air temperature and humidity of an interior unit heat exchanger.
[0013]A conditioner concerning this invention A compressor and an exterior unit heat exchanger which condensate-izes a gas refrigerant breathed out from this compressor, The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to an inlet side of a compressor, respectively, and decompress liquid cooling intermediation, The 1st and the 2nd interior unit heat exchanger which evaporate a refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into an accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, It has one set of an interior unit which has a blowing means which forms an air course for heat exchange to each interior unit heat exchanger, and a natural vaporization type humidifier formed in a primary side of an air course of each interior unit heat exchanger.
[0014]A conditioner concerning this invention A compressor and an exterior unit heat exchanger which condensate-izes a gas refrigerant breathed out from this compressor, The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to an inlet side of a compressor, respectively, and decompress liquid cooling intermediation, The 1st and the 2nd interior unit heat exchanger which evaporate a refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into an accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, One set of an interior unit which has a blowing means which forms an air course for heat exchange to each interior unit heat exchanger. It has a control device which controls more highly than evaporating temperature of the 2nd interior unit heat exchanger evaporating temperature of a natural vaporization type humidifier formed in a primary side of an air course of the 1st interior unit heat exchanger, and the 1st interior unit heat exchanger.
[0015]
[Embodiment of the Invention]Below embodiment 1. describes this embodiment of the invention 1 based on figures. Drawing 1 is a refrigerant circuit figure showing the composition of Embodiment 1. In this figure, A is an exterior unit and is constituted by each device described below. That is, it is the interior unit blowing means by which provide the exterior unit blowing means by which the compressor of a capacity variable type [1] and 2 were provided in the exterior unit heat exchanger, and 3 was provided in the exterior unit heat exchanger 2, and 4 in an collimator, 5 was provided in the interior unit heat exchanger, and 6 was provided in the interior unit heat exchanger 5, and the air course shown by the arrow 6A at the time of operation is formed. The refrigerant piping which 7 connects an accumulator, and 8 connects each above-mentioned device in series in above order, and constitutes a refrigerant circuit, The natural vaporization-type humidifier with which 9 was provided in the primary the air course 6A of the interior unit heat exchanger 5 side, The sink air-temperature detector in which 10 was provided in the suction side (primary side) of the air course of the interior unit heat exchanger 5, The blow-off air-temperature detector in which 11 was similarly provided in the blow-off side (secondary), The liquid side temperature detector in which 12 was provided near the entrance of the interior unit heat exchanger 5, the gas side temperature detector in which 13 was similarly provided near the exit, An interior unit control device which controls the interior unit B with which 14 contains the collimator 4 based on the detection result of each above-mentioned temperature detector, They are an exterior unit control device which 15 is provided in the

exterior unit A and carries out capacity control of the compressor 1, and a use side control device which 16 is provided in the use side and controls the interior unit control device 14 and the exterior unit control device 15.

[0016]Next, it explains that the refrigerant of the conditioner of Embodiment 1 flows. The hot and high-pressure gas refrigerant breathed out from the compressor 1 flows into the exterior unit heat exchanger 2, and it is cooled by the air etc. of ordinary temperature including air blasting of the exterior unit blowing means 3, and it is condensate-ized. The refrigerant which came out of the exterior unit heat exchanger 2 is decompressed with the collimator 4, and flows into the interior unit heat exchanger 5. Low temperature is generated in the interior unit heat exchanger 5, and a refrigerant evaporates, is gasified and flows out, a gas refrigerant flows into the accumulator 7, and after passing, it is inhaled to the compressor 1.

[0017]Next, control of the collimator 4 is explained using the flow chart of drawing 2. First, the superheating SH (= TH2-TH1) which is a difference of detection temperature TH1 of the liquid side temperature detector 12 of the interior unit heat exchanger 5 and detection temperature TH2 of the gas side temperature detector 13 is computed at Step S1. Next, it is judged whether the collimator 4 is extracted by size comparison with the superheating SH and the target superheating value SHm at Step S2, or it opens. In SH>SHm, the amount Sj2 of difference of the collimator 4 (SH) is computed at Step S3, and only Sj2 (SH) opens the collimator 4 by step S4 in it. In SH<SHm, the amount Sj1 of diaphragms of the collimator 4 (SH) is computed at Step S5 by Step S2, and only Sj1 (SH) extracts the collimator 4 at Step S6.

[0018]Next, the humidifier 9 is explained. The humidifier 9 adopts the humidification method of the natural vaporization type containing the **** film type which does not need an electric power supply, and humidifying performance changes with the temperature of the air which passes the humidifier 9, humidity, and air capacity. That is, since humidifying performance improves, and humidifying performance falls when reverse so that it is an elevated temperature, damp, and large air capacity, humidity control can be performed automatically. Since the air which passes the humidifier 9 will turn into air of low-temperature high humidity and a humidity effect will fall dramatically here if the humidifier 9 is installed in the secondary of the air course 6A of the interior unit heat exchanger 5, in Embodiment 1. He installs a humidifier in a primary the air course 6A of the interior unit heat exchanger 5 side, and is trying for the air which passes the humidifier 9 to turn into interior unit sink air with it. [a high temperature and] [damp] In this way, the air humidified with the humidifier 9 is cooled by the interior unit heat exchanger 5, and blows off to interior space. When the liquid side temperature of the interior unit heat exchanger 5 is lower than the dew-point temperature of the air humidified with the humidifier at this time, Since a part is condensed and it is dehumidified, it enables it to supply humidity to interior space by carrying out capacity control of the compressor 1, without being dehumidified, as the liquid side temperature becomes higher than the dew-point temperature.

[0019]Although the natural vaporization type humidifier 9 has a humidifying amount smaller than the humidifier of a compulsive formula, since dehumidification volume can be small stopped with the compressor 1 in which capacity control is possible, excessive humidification becomes unnecessary. Since especially the open air indoors introduced by ventilation in the summer or the interphase is humid, humidification is unnecessary. In winter, since the open air indoors introduced by ventilation has low humidity, humidification is needed, but in object air conditioning, such as a computer room, since there are few persons in the interior of a room for air conditioning, there may be few amounts of ventilation and the humidifying amount of a natural vaporization type humidifier is also enough as them.

[0020]Next, a control flow of the compressor 1 is explained using drawing 3. Blow-off air-temperature TH4 which blew off with target temperature TH4m of the blow-off air temperature set up by the use side control device 16 at Step S11, and was detected in the air-temperature detector 11 is compared. When TH4 is larger, desired value TH1m of the liquid side temperature of the interior unit heat exchanger 5 is made small at Step S12, and when TH4 is smaller, TH1m is enlarged at Step S13. Next, detection temperature TH3 of the interior unit sink air-temperature detector 10 and prescribed temperature, for example, a difference with 12 **, are computed at Step S14 as liquid side temperature lower limit TH1LMT (=TH3-12) corresponding

to the dew-point temperature. When TH1m is smaller than TH1LMT, it is made to be set to TH1 m=TH1LMT at Step S16 by Step S15. At Step S17, when detection temperature TH1 of the liquid side temperature detector 12 of an interior unit heat exchanger is larger than TH1m, Frequency of the compressor 1 is enlarged at Step S18, capacity is increased, when TH1 is smaller than TH1m, frequency of the compressor 1 is made small at Step S19, and capacity is made small.

[0021]Since the capacity of the compressor 1 is small controlled at the time of low loading, evaporating temperature becomes high and a sensible heat factor is operated in the state of 1. Although the capacity of the compressor 1 is greatly controlled at the time of a heavy load and evaporating temperature becomes low, if it is not humid environment, there is little dehumidification volume. In order to raise the humidity effect of the humidifier 9, it is necessary to raise evaporating temperature and to operate. Thus, it is possible to set dehumidification volume in the interior unit heat exchanger 5 to 0 by performing capacity control of the compressor 1 so that the liquid side detection temperature with the lowest temperature may become higher than the dew-point temperature in the interior unit heat exchanger 5.

[0022]In order to make target solution temperature degree TH1m higher than near the dew-point temperature or it as mentioned above, were made to control by Embodiment 1 considering solution temperature degree lower limit TH1LMT computed as interior unit sink air-temperature-12 as a temperature corresponding to the dew-point temperature, but. It absorbs using a humidity sensor, the dew-point temperature is computed from an air-temperature detection value and a humidity detection value, and it may be made to control the value as a degree of target solution temperature.

[0023]Even if evaporating temperature is high, cooling capacity can make it possible to fully secure the capacity of the interior unit heat exchanger 5 greatly by setting up a pipe supplementary biography hot surface product more than 70-m^2 per 28 kW of refrigeration capacity.

[0024]Even if evaporating temperature is high, cooling capacity can make it possible to fully secure also by setting the refrigerant path of the interior unit heat exchanger 5 so that it may be made for the refrigerant inlet side to be located in the secondary of the air course 6A of a heat exchanger and the refrigerant exit side may be located in a primary the air course 6A side.

[0025]Embodiment 2., next this embodiment of the invention 2 are described based on figures. Drawing 4 is a refrigerant circuit figure showing the composition of Embodiment 2. In this figure, identical codes are given to a portion the same as that of drawing 1, or considerable, and explanation is omitted. A different point from drawing 1 is a point which is constituted by one set of two sets of exterior units, and the interior unit which has two interior unit heat exchangers corresponding to each exterior unit, and formed two refrigerant circuits. That is, the 1st refrigerant circuit 100 is considered as the same composition as drawing 1 except the point that the interior unit heat exchanger of the interior unit B turns into the 1st interior unit heat exchanger 5. The 2nd refrigerant circuit 100S is considered as the same composition as the 1st refrigerant circuit 100 except the point that the humidifier 9 is not formed in the 2nd interior unit heat exchanger 5S of the interior unit B. The numerals of each device which constitutes the 2nd refrigerant circuit 100S add and show S to the numerals of the device with which the 1st refrigerant circuit 100 corresponds, and each explanation is omitted. The 1st of the interior unit B and the 2nd interior unit heat exchanger 5 and 5S are allocated in general in V type, and the interior unit blowing means 6 is absorbed in the upper part of the mid-position of both the interior unit heat exchangers 5 and 5S, and is established as a mold fan, and it is made to have an air course like the arrow 6A or 6AS formed like a graphic display.

[0026]Next, it explains that the refrigerant of Embodiment 2 flows. Since the flow of the refrigerant of the 1st and 2nd refrigerant circuits 100 and 100S is the same, only the 1st refrigerant circuit 100 is explained. The hot and high-pressure gas refrigerant breathed out from the compressor 1 flows into the exterior unit heat exchanger 2, and it is cooled by the air etc. of ordinary temperature including air blasting of the exterior unit blowing means 3, and it is condensate-ized. The refrigerant which came out of the exterior unit heat exchanger 2 is

decompressed with the collimator 4, and flows into the 1st interior unit heat exchanger 5. Low temperature is generated in the 1st interior unit heat exchanger 5, and a refrigerant evaporates, is gasified and flows out, a gas refrigerant flows into the accumulator 7, and after passing, it is inhaled to the compressor 1.

[0027]About control of the collimator 4, since the 1st and 2nd refrigerant circuit is the same as that of Embodiment 1, it omits explanation. Although allocated by only the 1st interior unit heat exchanger 5 about the humidifier 9, since the function is the same as that of Embodiment 1, explanation is omitted.

[0028]Next, a control flow of the compressor 1 is explained. Since it is the same as that of Embodiment 1 about the 1st refrigerant circuit 100, explanation is omitted, and a control flow of the compressor of the 2nd refrigerant circuit 100S is explained using drawing 5. Blow-off air-temperature TH4 which blew off with the value lower 1 ** than target temperature TH4m of the blow-off air temperature set up by the use side control device 16 at Step S21, and was detected in the air-temperature detector 11 is compared. When TH4 is larger, desired value TH1m of the liquid side temperature of the 2nd interior unit heat exchanger 5S is made small at Step S22, and when TH4 is smaller, TH1m is enlarged at Step S23. Detection temperature TH3 of an interior unit sink air-temperature detector and prescribed temperature, for example, a difference with 12 **, are computed as liquid side temperature TH1LMT (= TH3-12) corresponding to the dew-point temperature. When TH1m is smaller than TH1LMT, it is made to be set to TH1 m=TH1LMT at Step S26 by Step S25. At Step S27, when detection temperature TH1 of the liquid side temperature detector 12S of an interior unit heat exchanger is larger than TH1m, Frequency of the compressor 1S is enlarged at Step S28, capacity is increased, when TH1 is smaller than TH1m, frequency of the compressor 1S is made small at Step S29, and capacity is made small.

[0029]The 1st refrigerant circuit 100 and 2nd refrigerant circuit 100S, By only Steps S21 in drawing 5 differing, and reading low the target temperature of the 2nd refrigerant circuit 100S in which the humidifier is not formed rather than the 1st refrigerant circuit 100 in which the humidifier 9 is formed, As a result of controlling the capacity of the compressor 1S small rather than the 1st refrigerant circuit 100, evaporating temperature of the 2nd interior unit heat exchanger 5S of the 2nd refrigerant circuit 100S can be made high, and the humidity effect of the humidifier 9 can be raised. Since the capacity of a compressor is small controlled at the time of low loading, evaporating temperature becomes high and a sensible heat factor is operated in the state of 1.

[0030]Thus, it is possible to set dehumidification volume in an interior unit heat exchanger to 0 by performing capacity control of a compressor so that the liquid side detection temperature with the lowest temperature may become higher than the dew-point temperature in an interior unit heat exchanger.

[0031]In order to make target solution temperature degree TH1m higher than near the dew-point temperature or it, were made to control by Embodiment 2 considering solution temperature degree lower limit TH1LMT computed as interior unit sink air-temperature-12 as a temperature corresponding to the dew-point temperature, but. Using a humidity sensor, the dew-point temperature may be computed from a sink air-temperature detection value and a humidity detection value, and the value may be controlled as a degree of target solution temperature.

[0032]Even if evaporating temperature is high, cooling capacity can make it possible to fully secure the capacity of an interior unit heat exchanger greatly by setting up a pipe supplementary biography hot surface product more than 70-m^2 per 28 kW of refrigeration capacity.

[0033]Even if evaporating temperature is high, cooling capacity can make it possible to fully secure also by setting the refrigerant path of an interior unit heat exchanger so that it may be made for the refrigerant inlet side to be located in the secondary of the air course of a heat exchanger and the refrigerant exit side may be located in a primary air course side.

[0034]Although Embodiment 2 explained the case where two refrigerant circuits were constituted, the same effect is expectable even if it constitutes three or more refrigerant circuits.

[0035]

[Effect of the Invention]The exterior unit heat exchanger which condensate-izes the gas refrigerant in which the conditioner concerning this invention was breathed out from a compressor and this compressor, An exterior unit which has the accumulator connected to the inlet side of a compressor, and an collimator which decompresses the liquefied refrigerant from an exterior unit heat exchanger, The interior unit heat exchanger which is a use side, is allocated all over a predetermined air course, evaporates the refrigerant decompressed by the collimator, gasifies, and is made to flow into an accumulator, Since it has an interior unit which has the natural vaporization type humidifier formed in the primary side of the air course of this interior unit heat exchanger, it can humidify by low power consumption and simple maintenance.
[0036]The conditioner concerning this invention Since it has the refrigerant path shape allocated so that the refrigerant inlet of an interior unit heat exchanger might be located in the downstream of an air course and a refrigerant exit might be located in the primary side of an air course, Evaporating temperature of an interior unit heat exchanger can be made high, without spoiling cooling capacity, and a humidifier can be used efficiently.
[0037]Since the conditioner concerning this invention uses a compressor as a capacity variable type compressor, it can be humidified by low power consumption and simple maintenance.
[0038]Since the conditioner concerning this invention is provided with the control device which carries out capacity control of the compressor so that the liquid side temperature of an interior unit heat exchanger may turn into more than prescribed temperature, it can make high evaporating temperature of an interior unit heat exchanger, and a humidifier can be efficiently used for it.
[0039]The conditioner concerning this invention A compressor and the exterior unit heat exchanger which condensate-izes the gas refrigerant breathed out from this compressor, The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to the inlet side of a compressor, respectively, and decompress liquid cooling intermediation, The 1st and the 2nd interior unit heat exchanger which evaporate the refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into the accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, Since it has one set of the interior unit which has a blowing means which forms the air course for heat exchange to each interior unit heat exchanger, and the natural vaporization type humidifier formed in the primary side of the air course of each interior unit heat exchanger, it can humidify by low power consumption and simple maintenance.
[0040]The conditioner concerning this invention A compressor and the exterior unit heat exchanger which condensate-izes the gas refrigerant breathed out from this compressor, The 1st and 2nd collimators that are connected to two sets of exterior units and each exterior unit which have the accumulator connected to the inlet side of a compressor, respectively, and decompress liquid cooling intermediation, The 1st and the 2nd interior unit heat exchanger which evaporate the refrigerant which was connected to the 1st and 2nd collimator, respectively and was decompressed, gasify, make it flow into the accumulator of each exterior unit, respectively, and constitute two refrigerant circuits, One set of the interior unit which has a blowing means which forms the air course for heat exchange to each interior unit heat exchanger. In order to have a control device which controls more highly than the evaporating temperature of the 2nd interior unit heat exchanger the evaporating temperature of the natural vaporization type humidifier formed in the primary side of the air course of the 1st interior unit heat exchanger, and the 1st interior unit heat exchanger, Evaporating temperature of an interior unit heat exchanger can be made high, and a humidifier can be used efficiently.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a refrigerant circuit figure showing the composition of this embodiment of the invention 1.
[Drawing 2]It is a control flow chart figure in this embodiment of the invention 1.
[Drawing 3]It is a flow chart figure showing a control flow of the compressor in this embodiment of the invention 1.
[Drawing 4]It is a refrigerant circuit figure showing the composition of this embodiment of the invention 2.
[Drawing 5]It is a flow chart figure showing a control flow of the compressor of the 2nd refrigerant circuit in this embodiment of the invention 2.
[Description of Notations]
1 A compressor and 2 An exterior unit heat exchanger, 4 collimators, and 5 Interior unit heat exchanger, 7 An accumulator, 8 refrigerant piping, nine humidifiers, and 10 [The gas side temperature detector and 14 / An interior unit control device and 15 / An exterior unit control device, 16 use side control device, A exterior unit, and B / Interior unit.] A suction air-temperature detector and 11 A blowing off air temperature detector and 12 The liquid side temperature detector and 13

[Translation done.]

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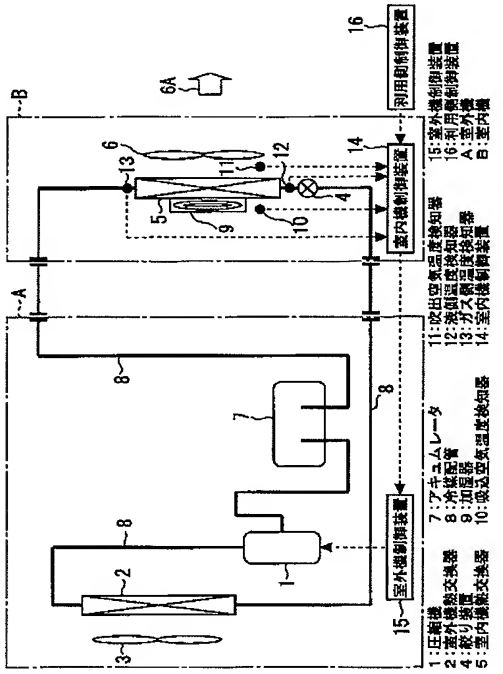
3L055 AA01 BC10 CA10
3L060 AA06 AA07 CC02 CC04 CC07
DD02 EE01

(54)【発明の名称】　空気調和装置

(57)【要約】
【課題】　年間を通じて冷房空調を行なう場合に、通常用いられているベーパーパン方式の加湿器は、定期的にメンテナンスを実施しないと加湿能力が低下し、装置の内部が汚れる他、常に電力を必要とするという問題点があった。
【解決手段】　圧縮機１と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器２と、圧縮機の吸入側に接続されたアキュムレータ７とを有する室外機Ａ、及び室外機熱交換器２からの液化冷媒を減圧する絞り装置４と、利用側で所定の風路中に配設され、絞り装置４によって減圧された冷媒を蒸発させてガス化し、アキュムレータに流入させる室内機熱交換器５と、この室内機熱交換器の風路６Ａの一次側に設けられた自然蒸発式加湿器９とを有する室内機Ｂを備えた構成とする。



【特許請求の範囲】
【請求項１】　圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、上記圧縮機の吸入側に接続されたアキュムレータとを有する室外機、及び上記室外機熱交換器からの液化冷媒を減圧する絞り装置と、利用側で所定の風路中に配設され、上記絞り装置によって減圧された冷媒を蒸発させてガス化し、上記アキュムレータに流入させる室内機熱交換器と、上記室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器とを有する室内機を備えたことを特徴とする空気調和装置。
【請求項２】　上記室内機熱交換器は、冷媒入口が風路の二次側に位置し、冷媒出口が風路の一次側に位置するように配設されたことを特徴とする請求項１記載の空気調和装置。
【請求項３】　上記室内機熱交換器の管外伝熱面積を、蒸発温度が高くても十分な冷却能力が確保できる程度に大きくすることを特徴とする請求項１または請求項２記載の空気調和装置。
【請求項４】　上記圧縮機を容量可変型の圧縮機としたことを特徴とする請求項１～請求項３のいずれか１項記載の空気調和装置。
【請求項５】　上記室内機熱交換器の液側温度が所定温度以上となるように圧縮機を容量制御する制御装置を備えたことを特徴とする請求項４記載の空気調和装置。
【請求項６】　上記所定温度は、露点温度であることを特徴とする請求項５記載の空気調和装置。
【請求項７】　上記露点温度は、室内機熱交換器の吸込空気温度から一定温度を差し引くことにより算出した液温度下限値を対応させるようにしたことを特徴とする請求項６記載の空気調和装置。
【請求項８】　上記露点温度は、室内機熱交換器の吸込空気温度と湿度にもとづいて算出するようにしたことを特徴とする請求項６記載の空気調和装置。
【請求項９】　圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、上記圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させ、２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、上記各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、及び上記各室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器を備えたことを特徴とする空気調和装置。
【請求項１０】　圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、上記圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させ、２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、上記各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、上記第１の室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器、及び上記第１の室内機熱交換器の蒸発温度を第２の室内機熱交換器の蒸発温度より高く制御する制御装置を備えたことを特徴とする空気調和装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、空気調和装置、特に電算機室のように、年間を通じて冷房空調を行なう空気調和装置に関するものである。
【０００２】
【従来の技術】従来の電算機室における年間冷房空気調和装置の圧縮機は固定容量であるため、低負荷時には再熱を行ない能力調整を行なっていた。その際、過大な除湿を伴なうため、湿度管理のために強制的に加湿を行なう周知のベーパーパン方式の加湿器を利用していた。
【０００３】
【発明が解決しようとする課題】ベーパーパン方式によって強制的に加湿を行なう従来の空気調和装置においては、常に電力を必要とするため消費電力が増加するという問題点があった。また、ベーパーパン方式では定期的にメンテナンスを実施しないと加湿能力の低下や空気調和装置の内部が汚れるという問題点があった。加湿器として消費電力が不要で清掃が容易な自然蒸発式加湿器を利用するとしても、自然蒸発式加湿器を通過する空気の温度が低いため十分な加湿能力を発揮することができず実用化は困難であった。
【０００４】この発明は、上記のような問題点を解決するためになされたもので、年間を通じて冷房空調を行なう場合において、自然蒸発式加湿器を圧縮機の容量制御により効率的に利用することができる空気調和装置を得ることを目的とする。
【０００５】
【課題を解決するための手段】この発明に係る空気調和装置は、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する室外機、及び室外機熱交換器からの液化冷媒を減圧する絞り装置と、利用側で所定の風路中に配設され、絞り装置によって減圧された冷媒を蒸発させてガス化し、アキュムレータに流入させる室内機熱交換器と、この室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器とを有する室内機を備えたものである。
【０００６】この発明に係る空気調和装置は、また、室内機熱交換器の冷媒入口を風路の二次側に位置させ、冷

媒出口を風路の一次側に位置させるように配設したものである。

【０００７】この発明に係る空気調和装置は、また、室内機熱交換器の管外伝熱面積を、蒸発温度が高くても十分な冷却能力が確保できる程度に大きくするものである。

【０００８】この発明に係る空気調和装置は、また、圧縮機を容量可変型の圧縮機としたものである。

【０００９】この発明に係る空気調和装置は、また、室内機熱交換器の液側温度が所定温度以上となるように圧縮機を容量制御する制御装置を備えたものである。

【００１０】この発明に係る空気調和装置は、また、所定温度を露点温度としたものである。

【００１１】この発明に係る空気調和装置は、また、露点温度として室内機熱交換器の吸込空気温度から一定温度を差し引くことにより算出した液温度下限値を対応させるようにしたものである。

【００１２】この発明に係る空気調和装置は、露点温度を室内機熱交換器の吸込空気温度と湿度にもとづいて算出するようにしたものである。

【００１３】この発明に係る空気調和装置は、また、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させ、２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、及び各室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器を備えたものである。

【００１４】この発明に係る空気調和装置は、また、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させて２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、第１の室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器、及び第１の室内機熱交換器の蒸発温度を第２の室内機熱交換器の蒸発温度より高く制御する制御装置を備えたものである。

【００１５】

【発明の実施の形態】実施の形態１．以下、この発明の実施の形態１を図にもとづいて説明する。図１は、実施の形態１の構成を示す冷媒回路図である。この図において、Ａは室外機で、以下に述べる各装置によって構成されている。即ち、１は容量可変型の圧縮機、２は室外機熱交換器、３は室外機熱交換器２に設けられた室外機送風手段、４は絞り装置、５は室内機熱交換器、６は室内機熱交換器５に設けられた室内機送風手段で、動作時に矢印６Ａで示す風路を形成する。７はアキュムレータ、８は上記各装置を上記の順に直列に接続し、冷媒回路を構成する冷媒配管、９は室内機熱交換器５の風路６Ａの１次側に設けられた自然蒸発式の加湿器、１０は室内機熱交換器５の風路の吸込み側（１次側）に設けられた吸込み空気温度検知器、１１は同じく吹出し側（２次側）に設けられた吹出し空気温度検知器、１２は室内機熱交換器５の入口近傍に設けられた液側温度検知器、１３は同じく出口近傍に設けられたガス側温度検知器、１４は上記各温度検知器の検知結果にもとづいて絞り装置４を含む室内機Ｂを制御する室内機制御装置、１５は室外機Ａに設けられ圧縮機１を容量制御する室外機制御装置、１６は利用側に設けられ室内機制御装置１４及び室外機制御装置１５を制御する利用側制御装置である。

【００１６】次に、実施の形態１の空気調和装置の冷媒の流れについて説明する。圧縮機１から吐出される高温、高圧のガス冷媒は、室外機熱交換器２へ流入し、室外機送風手段３の送風を含む常温の空気などにより冷却されて凝縮液化する。室外機熱交換器２を出た冷媒は絞り装置４で減圧され、室内機熱交換器５へ流入する。室内機熱交換器５で低温を発生すると共に、冷媒は蒸発しガス化して流出し、ガス冷媒がアキュムレータ７へ流入し、通過した後、圧縮機１へ吸入される。

【００１７】次に、絞り装置４の制御について図２のフローチャートを用いて説明する。まず、ステップＳ１で室内機熱交換器５の液側温度検知器１２の検出温度ＴＨ１と、ガス側温度検知器１３の検出温度ＴＨ２との差であるスーパーヒートＳＨ（＝ＴＨ２－ＴＨ１）を算出する。次に、ステップＳ２でスーパーヒートＳＨと目標スーパーヒート値ＳＨｍとの大小比較により絞り装置４を絞るか開けるかを判断する。ＳＨ＞ＳＨｍの場合には、ステップＳ３で絞り装置４の開き量Ｓｊ２（ＳＨ）を算出し、ステップＳ４でＳｊ２（ＳＨ）だけ絞り装置４を開く。また、ステップＳ２でＳＨ＜ＳＨｍの場合には、ステップＳ５で絞り装置４の絞り量Ｓｊ１（ＳＨ）を算出し、ステップＳ６でＳｊ１（ＳＨ）だけ絞り装置４を絞る。

【００１８】次に、加湿器９について説明する。加湿器９は電力供給の不要な、透質膜式を含む自然蒸発式の加湿方式を採用したものであり、加湿器９を通過する空気の温度、湿度、風量により加湿性能が変化する。即ち、高温、低湿、大風量であるほど加湿性能が向上し、逆の場合は加湿性能が低下するため、自動的に湿度調整が行なえる。ここで、加湿器９を室内機熱交換器５の風路６Ａの２次側に設置すると、加湿器９を通過する空気が低

温多湿の空気となって加湿効率が非常に低下するため、実施の形態１では、加湿器を室内機熱交換器５の風路６Ａの１次側に設置し、加湿器９を通過する空気が、温度が高く低湿な室内機吸込み空気となるようにしている。こうして加湿器９により加湿された空気は、室内機熱交換器５により冷やされて室内空間に吹出される。このとき、室内機熱交換器５の液側温度が加湿器により加湿された空気の露点温度よりも低い場合には、一部凝縮して除湿されるため、圧縮機１を容量制御することにより、液側温度が露点温度よりも高くなるようにして、除湿されることなく室内空間に湿度を供給し得るようにしている。

【００１９】自然蒸発式加湿器９は強制式の加湿器よりも加湿量が小さいが、容量制御可能な圧縮機１により除湿量を小さく抑えることができるため、過大な加湿は不要となる。特に、夏季や中間期においては、換気により室内に導入された外気は湿度が高いため加湿は不要である。また、冬季において、換気により室内に導入された外気は湿度が低いため加湿が必要となるが、電算機室等の対物空気調和においては、空調対象の室内での人の数が少ないため換気量は少なくてよく、自然蒸発式加湿器の加湿量でも十分である。

【００２０】次に、圧縮機１の制御の流れについて図３を用いて説明する。ステップＳ１１で利用側制御装置１６により設定された吹出し空気温度の目標温度ＴＨ４ｍと吹出し空気温度検知器１１で検出された吹出し空気温度ＴＨ４とを比較する。ＴＨ４の方が大きい場合は、ステップＳ１２で室内機熱交換器５の液側温度の目標値ＴＨ１ｍを小さくし、ＴＨ４の方が小さい場合は、ステップＳ１３でＴＨ１ｍを大きくする。次に、ステップＳ１４で室内機吸込み空気温度検知器１０の検出温度ＴＨ３と所定温度、例えば１２℃との差を露点温度に対応する液側温度下限値ＴＨ１ＬＭＴ（＝ＴＨ３－１２）として算出する。ステップＳ１５でＴＨ１ｍがＴＨ１ＬＭＴよりも小さいときは、ステップＳ１６でＴＨ１ｍ＝ＴＨ１ＬＭＴとなるようにする。また、ステップＳ１７で室内機熱交換器の液側温度検知器１２の検出温度ＴＨ１がＴＨ１ｍよりも大きいときは、ステップＳ１８で圧縮機１の周波数を大きくして容量を増大させ、ＴＨ１がＴＨ１ｍより小さいときは、ステップＳ１９で圧縮機１の周波数を小さくして容量を小さくする。

【００２１】低負荷時は圧縮機１の容量は小さく制御されるため、蒸発温度は高くなり顕熱比が１の状態で運転される。また、高負荷時は圧縮機１の容量は大きく制御され蒸発温度は低くなるが、多湿環境でなければ除湿量は少ない。加湿器９の加湿効率を上げるためには蒸発温度を上げて運転する必要がある。このように、室内機熱交換器５の中で最も温度の低い液側検出温度が露点温度よりも高くなるように圧縮機１の容量制御を行なうことで室内機熱交換器５での除湿量を０とすることが可能である。

【００２２】実施の形態１では、上述のように目標液温度ＴＨ１ｍを露点温度付近あるいはそれよりも高くするために、室内機吸込み空気温度－１２として算出した液温度下限値ＴＨ１ＬＭＴを露点温度に対応する温度として制御を行なうようにしたが、湿度センサーを用いて吸込み空気温度検出値と湿度検出値とから露点温度を算出し、その値を目標液温度として制御するようにしてもよい。

【００２３】また、室内機熱交換器５の容量を大きく、例えば管外伝熱面積を冷却能力２８ｋＷあたり７０ｍ²以上に設定することにより、蒸発温度が高くても冷房能力が十分に確保できるようにすることができる。

【００２４】更に、室内機熱交換器５の冷媒パスを、冷媒入口側が熱交換器の風路６Ａの２次側に位置するようにし、冷媒出口側が風路６Ａの１次側に位置するように設定することによっても、蒸発温度が高くても冷房能力が十分に確保できるようにすることができる。

【００２５】実施の形態２．次に、この発明の実施の形態２を図にもとづいて説明する。図４は、実施の形態２の構成を示す冷媒回路図である。この図において、図１と同一または相当部分には同一符号を付して説明を省略する。図１と異なる点は、２台の室外機と、各室外機に対応した２つの室内機熱交換器を有する１台の室内機とによって構成され、２つの冷媒回路を形成するようにした点である。即ち、第１の冷媒回路１００は、室内機Ｂの室内機熱交換器が第１の室内機熱交換器５となる点以外は図１と同じ構成とされている。また、第２の冷媒回路１００Ｓは、室内機Ｂの第２の室内機熱交換器５Ｓに加湿器９が設けられていない点以外は第１の冷媒回路１００と同じ構成とされている。第２の冷媒回路１００Ｓを構成する各装置の符号は、第１の冷媒回路１００の対応する装置の符号にＳを付加して示し、個々の説明は省略する。なお、室内機Ｂの第１及び第２の室内機熱交換器５、５Ｓは、図示のように、おおむねＶ字形に配設され、室内機送風手段６は両室内機熱交換器５、５Ｓの中間位置の上部に吸込み型ファンとして設けられ、矢印６Ａあるいは６ＡＳのような風路を形成するようにされている。

【００２６】次に、実施の形態２の冷媒の流れについて説明する。第１及び第２の冷媒回路１００、１００Ｓの冷媒の流れは同一であるため、第１の冷媒回路１００についてのみ説明する。圧縮機１から吐出される高温、高圧のガス冷媒は、室外機熱交換器２へ流入し、室外機送風手段３の送風を含む常温の空気などにより冷却されて凝縮液化する。室外機熱交換器２を出た冷媒は絞り装置４で減圧され、第１の室内機熱交換器５へ流入する。第１の室内機熱交換器５で低温を発生すると共に、冷媒は蒸発しガス化して流出し、ガス冷媒がアキュムレータ７へ流入し、通過した後、圧縮機１へ吸入される。

【００２７】絞り装置４の制御については、第１、第２の冷媒回路ともに実施の形態１と同様であるため説明を省略する。また、加湿器９については、第１の室内機熱交換器５にのみ配設されているが、その機能は実施の形態１と同様であるため説明を省略する。

【００２８】次に、圧縮機１の制御の流れについて説明する。第１の冷媒回路１００については実施の形態１と同様であるため説明を省略し、第２の冷媒回路１００Ｓの圧縮機の制御の流れについて図５を用いて説明する。ステップＳ２１で利用側制御装置１６により設定された吹出し空気温度の目標温度ＴＨ４ｍよりも１℃低い値と吹出し空気温度検知器１１で検出した吹出し空気温度ＴＨ４とを比較する。ＴＨ４の方が大きい場合は、ステップＳ２２で第２の室内機熱交換器５Ｓの液側温度の目標値ＴＨ１ｍを小さくし、ＴＨ４の方が小さい場合は、ステップＳ２３でＴＨ１ｍを大きくする。室内機吸込み空気温度検知器の検出温度ＴＨ３と所定温度、例えば１２℃との差を露点温度に対応する液側温度ＴＨ１ＬＭＴ（＝ＴＨ３－１２）として算出する。ステップＳ２５でＴＨ１ｍがＴＨ１ＬＭＴよりも小さいときは、ステップＳ２６でＴＨ１ｍ＝ＴＨ１ＬＭＴとなるようにする。また、ステップＳ２７で室内機熱交換器の液側温度検知器１２Ｓの検出温度ＴＨ１がＴＨ１ｍよりも大きいときは、ステップＳ２８で圧縮機１Ｓの周波数を大きくして容量を増大させ、ＴＨ１がＴＨ１ｍより小さいときは、ステップＳ２９で圧縮機１Ｓの周波数を小さくして容量を小さくする。

【００２９】なお、第１の冷媒回路１００と第２の冷媒回路１００Ｓとは、図５中のステップＳ２１のみが異なり、加湿器９を設けている第１の冷媒回路１００よりも加湿器を設けていない第２の冷媒回路１００Ｓの目標温度を低く読み替えることにより、第１の冷媒回路１００よりも圧縮機１Ｓの容量を小さく制御する結果、第２の冷媒回路１００Ｓの第２の室内機熱交換器５Ｓの蒸発温度を高くして加湿器９の加湿効率を上昇させることができる。更に、低負荷時は圧縮機の容量は小さく制御されるため、蒸発温度は高くなり顕熱比が１の状態で運転される。

【００３０】このように、室内機熱交換器の中で最も温度の低い液側検出温度が露点温度よりも高くなるように圧縮機の容量制御を行なうことで室内機熱交換器での除湿量を０とすることが可能である。

【００３１】実施の形態２では、目標液温度ＴＨ１ｍを露点温度付近あるいはそれより高くするために、室内機吸込み空気温度－１２として算出した液温度下限値ＴＨ１ＬＭＴを露点温度に対応する温度として制御を行なうようにしたが、湿度センサーを用いて、吸込み空気温度検出値と湿度検出値とから露点温度を算出し、その値を目標液温度として制御してもよい。

【００３２】また、室内機熱交換器の容量を大きく、例えば管外伝熱面積を冷却能力２８ｋＷあたり７０ｍ^{2}以上に設定することにより、蒸発温度が高くても冷房能力が十分に確保できるようにすることができる。

【００３３】更に、室内機熱交換器の冷媒パスを、冷媒入口側が熱交換器の風路の２次側に位置するようにし、冷媒出口側が風路の１次側に位置するように設定することによっても、蒸発温度が高くても冷房能力が十分に確保できるようにすることができる。

【００３４】なお、実施の形態２では、２つの冷媒回路を構成する場合について説明したが、３つ以上の冷媒回路を構成するようにしても、同様な効果を期待することができる。

【００３５】

【発明の効果】この発明に係る空気調和装置は、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する室外機、及び室外機熱交換器からの液化冷媒を減圧する絞り装置と、利用側で所定の風路中に配設され、絞り装置によって減圧された冷媒を蒸発させてガス化し、アキュムレータに流入させる室内機熱交換器と、この室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器とを有する室内機を備えたものであるため、低い消費電力と簡易なメンテナンスで加湿を行なうことができる。

【００３６】この発明に係る空気調和装置は、また、室内機熱交換器の冷媒入口を風路の二次側に位置させ、冷媒出口を風路の一次側に位置させるように配設した冷媒パス形状を有するため、冷房能力を損なうことなく室内機熱交換器の蒸発温度を高くすることができ、加湿器を効率良く利用することができる。

【００３７】この発明に係る空気調和装置は、また、圧縮機を容量可変型の圧縮機としたものであるため、低い消費電力と簡易なメンテナンスで加湿を行なうことができる。

【００３８】この発明に係る空気調和装置は、また、室内機熱交換器の液側温度が所定温度以上となるように圧縮機を容量制御する制御装置を備えたものであるため、室内機熱交換器の蒸発温度を高くすることができ、加湿器を効率良く利用することができる。

【００３９】この発明に係る空気調和装置は、また、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させ、２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、及び各室内機熱交換器の風路の一次側に設けら

れた自然蒸発式加湿器を備えたものであるため、低い消費電力と簡易なメンテナンスで加湿を行なうことができる。

【００４０】この発明に係る空気調和装置は、また、圧縮機と、この圧縮機から吐出されたガス冷媒を凝縮液化する室外機熱交換器と、圧縮機の吸入側に接続されたアキュムレータとを有する２台の室外機、各室外機にそれぞれ接続され液冷媒を減圧する第１及び第２の絞り装置と、第１、第２の絞り装置にそれぞれ接続され減圧された冷媒を蒸発させてガス化し、各室外機のアキュムレータにそれぞれ流入させて２つの冷媒回路を構成する第１及び第２の室内機熱交換器と、各室内機熱交換器に対して熱交換用の風路を形成する送風手段とを有する１台の室内機、第１の室内機熱交換器の風路の一次側に設けられた自然蒸発式加湿器、及び第１の室内機熱交換器の蒸発温度を第２の室内機熱交換器の蒸発温度より高く制御する制御装置を備えたものであるため、室内機熱交換器の蒸発温度を高くすることができ、加湿器を効率良く利用することができる。

【図面の簡単な説明】

【図１】　この発明の実施の形態１の構成を示す冷媒回路図である。

【図２】　この発明の実施の形態１における制御フローチャート図である。

【図３】　この発明の実施の形態１における圧縮機の制御の流れを示すフローチャート図である。

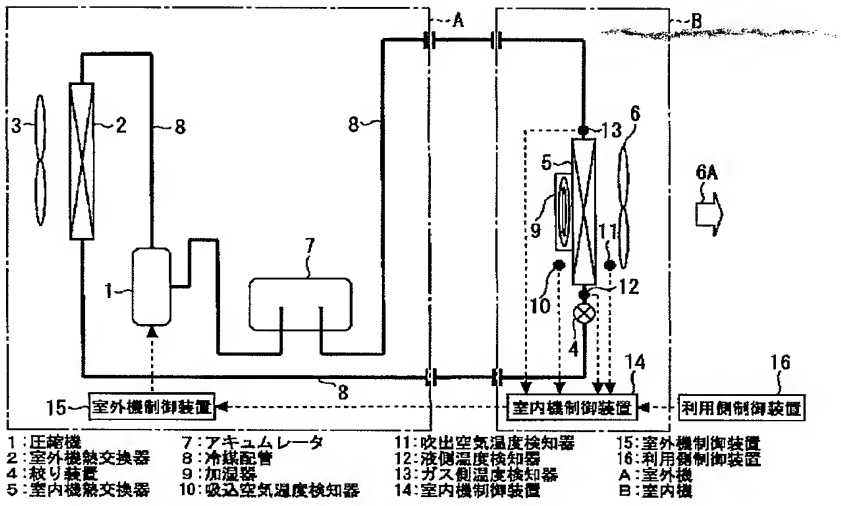
【図４】　この発明の実施の形態２の構成を示す冷媒回路図である。

【図５】　この発明の実施の形態２における第２の冷媒回路の圧縮機の制御の流れを示すフローチャート図である。

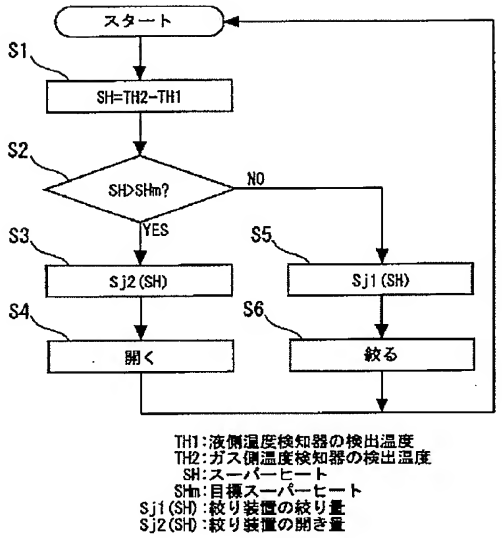
【符号の説明】

１　圧縮機、　２　室外機熱交換器、　４　絞り装置、　５　室内機熱交換器、　７　アキュムレータ、　８　冷媒配管、　９　加湿器、　１０　吸込空気温度検知器、　１１　吹出空気温度検知器、　１２　液側温度検知器、　１３　ガス側温度検知器、　１４　室内機制御装置、　１５　室外機制御装置、　１６利用側制御装置、　Ａ　室外機、　Ｂ　室内機。

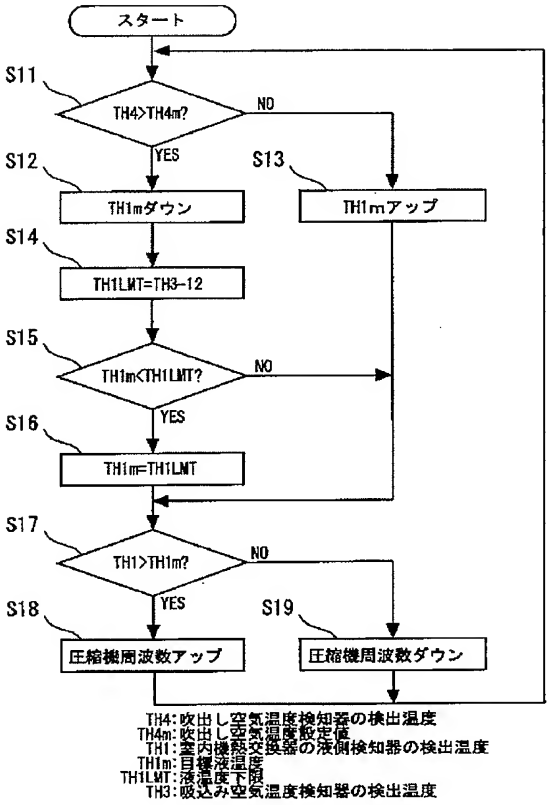
【図１】



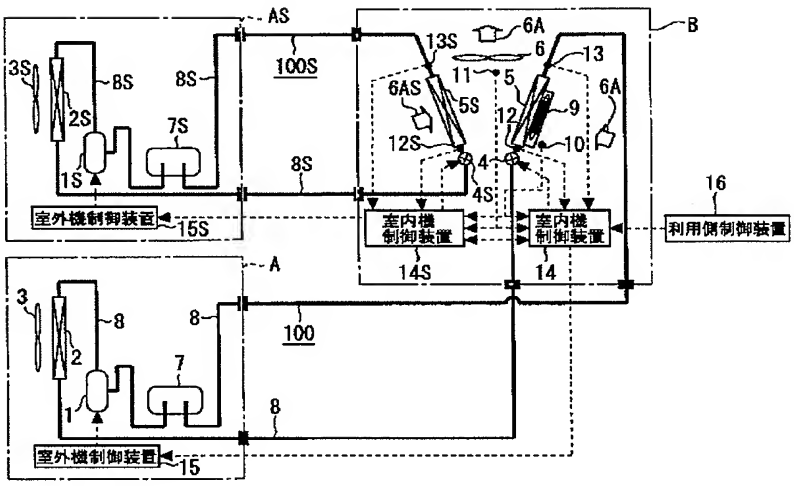
【図2】


スタート
S1
SH=TH2-TH1
S2
SH>SHm?
NO
YES
S3
Sj2(SH)
S5
Sj1(SH)
S4
開く
S6
絞る
TH1:液側温度検知器の検出温度
TH2:ガス側温度検知器の検出温度
SH:スーパーヒート
SHm:目標スーパーヒート
Sj1(SH):絞り装置の絞り量
Sj2(SH):絞り装置の開き量

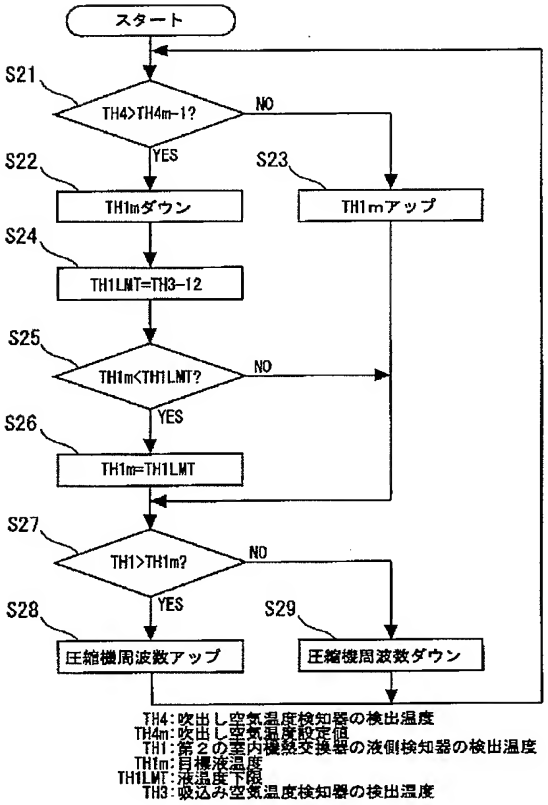
【図3】


スタート
S11
TH4>TH4m?
NO
YES
S12
TH1mダウン
S13
TH1mアップ
S14
TH1LMT=TH3-12
S15
TH1m<TH1LMT?
NO
YES
S16
TH1m=TH1LMT
S17
TH1>TH1m?
NO
YES
S18
圧縮機周波数アップ
S19
圧縮機周波数ダウン
TH4:吹出し空気温度検知器の検出温度
TH4m:吹出し空気温度設定値
TH1:室内機熱交換器の液側検知器の検出温度
TH1m:目標液温度
TH1LMT:液温度下限
TH3:吸込み空気温度検知器の検出温度

【図4】


AS
100S
3S
8S
2S
7S
1S
室外機制御装置
15S
6A
13S
6
13
11
5
6AS
5S
12
9
12S
10
4
4S
室内機制御装置
14S
室内機制御装置
14
16
利用側制御装置
B
A
3
8
2
7
1
100
室外機制御装置
15

【図５】



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